THE AMERICAN ARCHITECT AND BUILDING NEWS.

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THE report of the Select Committee on the New York Hospital to the Board of Governors is in favor of the adoption of the cottage plan; that is, the plan of building a series of small houses of one story, and containing a few rooms each, in a country district, and retaining in the city itself only reception-houses here and there, to which patients may be carried for immediate attendance in emergencies. The cottages are slightly built, so that they can be pulled down and renewed at no great expense, whenever they have become infected; and the purpose of their advocates is to secure the maximum of air, light, and isolation, for the sake both of the patients and the neighborhood. There has been much arguing in favor of this kind of hospital, of late years, and the experiment has been tried with some success in Europe; but, so far as we know, there has been no attempt to carry it out on a large scale in this country. In fact, in spite of all its advocates say for it, it cannot be otherwise than costly in a country in which attendance is so expensive as in ours. Still the arguments in its favor are too strong to allow mere economy of administration to set them aside. The proofs that old hospitals become dangerously infected, and this not only from what are classed as contagious diseases, are convincing. The greater proportion of deaths in permanent than in temporary hospitals is very decisive; and as yet no system of construction has been introduced by which the lodgment of infectious effluvium in the walls of the buildings themselves can be satisfactorily prevented.

THE Journal of the American Society of Engineers for April contains an elaborate and interesting article by Mr. G. W. R. Bayley, on levees as a system of reclaiming lowlands. The writer argues in favor of a complete system of levees for the Mississippi, constructed and maintained at the expense of the Government. It may be noted, that, since the banks of the river slope downward away from the water, every successive caving in or wearing away of the bank requires that the levee, set farther back down the slope, shall be higher than its predecessor. Thus, when the river was first embanked below Red River, levees of four or five feet high were sufficient where now fifteen and even twenty feet are necessary; and the levees, being so much higher, have to be proportionally broader than before, and are ten times as costly. Mr. Bayley argues at length and strongly against the theory that levees, by closing the lateral outlets of the river during floods, tend to raise the flood-level of the water; and he brings evidence to show that, against the opinion expressed by Humphreys and Abbot in their well-known report, the increased volume of the water does invade the hard clay bottom during floods, and that the depth of lower portions of the river increases. He also opposes the statement of Reclus in The Earth, that the Mississippi is an unaccountable exception to the law that all rivers which flow towards the equator hug their western banks (tending like the trade-winds to drag behind the earth as it revolves with increasing velocity under them). He thinks that the Mississippi does hug its western bank, but that the result of this tendency is to deposit alluvium on that side to an amount that by its accumulation actually forces the water eastward.

IT is not enough in these days, that political geography should change so fast that only school-teachers can follow it; but the engineers have set to work to change the features of the Earth's surface, and alter the physical geography as well. The Dutch are never at rest; and their proposed draining of part of the Zuyder Zee will add, it is said, seven or eight hundred square miles of territory to the kingdom. It is only a little while since the proposition was made for invading the northern part of the Sahara by letting the Atlantic into the inland basin which exists there. Now an American engineer, Mr. Spalding, has laid before the Russian Government a project for letting the water of the Black Sea into the Caspian, and so raising the latter to the level of the Mediterranean. It has long been agreed that the surface of the Caspian Sea was below that of the Mediterranean, though authorities varied in their estimates of the difference of level, some setting it as low as forty feet, and others as high as three hundred and fifty feet; the lowest estimate being the latest, however. Fortunately for Mr. Spalding's project, the River Don, flowing into the Sea of Azof, and the Volga, flowing into the Caspian, approach each other to within some seventy or eighty miles at one point of their course. Mr. Spalding proposes to direct the water of the Don by a canal into the Volga, and to reverse the current of the lower part so that the water of the Black Sea shall also flow through the canal, and so into the Caspian. He proposes another and longer canal farther south, but making a more direct communication. He estimates that the canals, once opened, may be left to themselves, and, enlarged by the wear of the current, will raise the level of the Caspian Sea to that of the Black in the course of a generation. The shores of the Caspian, especially on the north and east, are very flat; and to raise its level by any considerable amount would submerge a large area. Mr. Spalding thinks his project would add nearly one-half to the area of the sea, which has for a long time been shrinking and drying up, and would greatly amend the arid climate of its borders, as well as afford valuable inland communication.

THE Algerian project is awaiting the result of careful surveys of the route. A very good account of its conditions is to be found in the Popular Science Monthly for April. There is a considerable depression in the continent south of Algeria, — a sort of valley to the south of the Atlas Mountains, extending from the Gulf of Cabes in Tunis (the ancient Syrtis Minor) to the Atlantic coast near the Canary Isles. The surface of this depression is mostly below the seas; and geologists suppose that it was once a connecting strait between the Mediterranean and the Atlantic. At the eastern end of it is a series of hollows called by the Arabs *Shotts* or *Sebkas* (lake-beds or salt-marshes), into which water flows from the mountains in winter and spring, but which dry up into salt-beds in the summer. These *Shotts* it is proposed to connect with the Mediterranean by a canal cut through the sand-ridge which separates El Jerid in Tunis from the sea. The canal need be only thirteen miles long, and will supply a lake some thirty or forty miles wide, and three hundred and fifty long, at a cost of twenty millions of francs. It is believed that this lake would occupy the position of the Lake Tritonis mentioned by Herodotus and other ancient writers, into which it was fabled that the ship Argo was blown. The opening of it is expected not only to reclaim the adjacent regions from sterility, but to give the colony an important route for traffic

with Central Africa. Lately, however, a French *savant* has reported a ridge of sandstone between the *Shotts* and the sea, which if it exists will not only do away with the Lake Tritonis and the prehistoric communication, but will form an impenetrable obstacle to the canal.

A SOMEWHAT curious ecclesiastico-architectural quarrel is attracting general attention in England. Many of our readers, no doubt, remember that Mr. Street has been at work for some years on the restoration and completion of Bristol Cathedral. The cathedral has been without a nave for three hundred and fifty years, since the old Norman nave was pulled down. It appears that the Dean and Chapter had not desired the completion of the building, nor lent assistance to it in any way, but had allowed it to be carried on by private subscription and in charge of a committee, who had received the Dean's approval of the designs made for it by Mr. Street. The work has been nearly finished; and last winter, during the absence of the Dean, who was visiting at Nice, the north porch, a gift from the secretary of the committee, was decorated with a series of statues by Mr. Redfern. Not long ago the Dean returned; and presently, supported by a resolution of the Chapter, sent workmen, who pulled down the statues with a haste that more or less injured the work, and who, it appears, deliberately broke one of them to pieces. The accounts that we see do not indicate that the Dean gave notice of his intention, though he had sent a letter to the committee, which was not received till after the statues were pulled down. The committee thereupon at once resigned their charge, deciding to discontinue the work, and invest the money which remained in their hands for the disposal of the subscribers, leaving the Dean and Chapter with the nave and restorations, which it would cost some fifteen thousand dollars to complete, in their own hands, to deal with as they see fit.

THE published letters of the Dean and the architect show that, during the progress of the work, the Dean had carefully avoided holding any communication with Mr. Street concerning it, recognizing only the committee in the matter, but giving a tacit consent to the introduction of the statues as indicated in the drawings. But the root of the difficulty is the *odium theologicum*. The sculptures consisted of statues of the four doctors of the Church, — Saints Gregory, Augustine, Ambrose, and Jerome, — and the adoration of the Magi. The Dean, judging from the sketches shown him, seems to have taken it for granted that the four statues were the four evangelists, and made no objection to the design. The committee apparently left Mr. Street to arrange the sculptures as he chose. But the introduction of the cardinal's hat and the tiara, on the heads of Saints Jerome and Gregory, and the representation of the Virgin, brought down the Dean's workmen; and the figure of the Virgin was not only taken down, but destroyed. It is difficult to make out, from the accounts we read, how the responsibility for these troubles is to be divided; and it is to outsiders a matter rather curious than important. The Dean did not know what the statues were to be till they were in place. The committee appear to have left the matter to Mr. Street: Mr. Street does not admit the responsibility, and the sculptor is silent. But two or three things are clear: that where there was no communication between the architect in charge of a costly and important work, and the functionary on whom rested the final authority over it, the ingredients of a very pretty quarrel were mixing; that though in purely architectural detail an architect — his general design and treatment once approved, and limit of cost observed — ought to be untrammelled and supreme, yet in such a matter as symbolic sculpture, especially ecclesiastical, it is not safe or reasonable for him to exercise unquestioned control; and that in this case, the removal without consultation and the reckless mutilation of works of art which had not yet ceased to be private property of the donor, and the setting-up of which could not be considered a trespass, was a hot-headed if not a high-handed procedure. The moral is the old and homely one, that operations carried on in conjoint authority and without common understanding are pretty sure to lead to an explosion.

CONCRETE BUILDING. — I.

A GREAT deal of attention has been given of late in England and the United States to different uses of concrete in building; and there has been much debate as to its fitness both practically and artistically. It seems to grow into favor; at least, it is continually pushed more into notice, and the devices for its use are endless; but its proper functions and the limits of its use are not yet determined. In its coarse form, as a mixture of mortar, gravel, and broken stone or brick, it has a standing use where mere rough masses are required, as in foundations, the fillings of heavy piers, sea-walls, and the like; but now the employment of finer kinds of concrete, made to more or less resemble stone, and to serve for finished work, is greatly increasing, and in some quarters is strongly urged.

The advantages looked for from the use of concrete, naturally, are economy, durability, strength, and resistance to fire. Perhaps not one of these can be said to be thoroughly established by a large experience; but much is claimed. There are two ways in which concrete may be used, — in definite masses, shaped before they are placed; and in bulk, so to speak, that is, formed in one mould in its intended place, so that the whole structure built of it is one unbroken mass. When it is made into uniform blocks, and built up into a wall, it is difficult to see its advantage over brick, except sometimes in color, or over stone, to both of which it is in some respects inferior.

The question of cost in concrete is a pretty uncertain one, because there are all sorts of concrete. Doubtless a concrete may be made, which, in the mass, is a good deal cheaper than brick-work, by hastily putting together a hastily mixed mortar with any mineral rubbish that is at hand; but such a concrete is as much inferior as it is cheaper. And a neat-looking concrete of sand may be made which is as cheap as most building-stones; but, to make a really strong and durable concrete of fine texture, is probably as costly as to quarry and hew stones in simple forms. Wherever stone is to be had from quarries within reasonable distance, it is likely, as a raw material, to be cheaper than fine concrete. It is when it comes to working the material into difficult or complex forms or ornament, that the greater cheapness of concrete appears; and practically the attention of manufacturers has latterly been diverted from making it into building-blocks, and turned to its use in slabs and moulded work. To get out broad slabs of stone, for instance, is difficult and costly, and thin ones cost more than thick; but in concrete a slab is as cheap as any other form, and the thin one is the cheaper.

Probably the most active inducement to bring forward so many kinds of cements and concretes, which may be easily moulded into all sorts of forms, is the desire that prevails to supply an abundance of cheap ornament, and which would extend the stucco-worker's art into new domains. Against this tendency the considerate architect will set his face; and he will insist that, so far as he can control the use of the new material, it shall not be made the excuse for introducing a new deluge of cheap decoration. In this respect, it will stand on the same footing as plaster; and whatever treatment is reasonable in plaster will be equally reasonable in concrete.

But another great temptation to the use of concrete is the opportunity it gives of making homogeneous and jointless masses or constructions of almost any size or form, so that, as is well known, whole buildings may be constructed in one

piece, as it were. We have seen in Paris a house which might almost be said to be built of a single stone; foundations, walls, partitions, floors, and roof being of concrete laid up in a gigantic mould *in situ*, and forming a uniform mass without seam, the staircases only being moulded separately, but each in a single block. The béton-coignet of which such houses, as well as the city sewers and other important works, are built in Paris, has endured very well the tests of time and exposure to the French climate. A church, to be sure, which was built of this material at Vesniel, is said to have failed from want of care in mixing the concrete; but other structures have shown durability as far as they have had time. This way of building does seem to have some economical advantage over stone-work, because the cost of laying stone increases very rapidly with the height of the wall; and the expense of carrying up the mixed materials for concrete in hods would not grow nearly so fast as that of lifting stones by a derrick, to say nothing of the comparative cost of string-courses, caps, and other moulded work. When done, however, as we have seen it in the United States, by merely laying up a wall of rough concrete of mortar and broken stone thrown into a boxing, and finishing the whole afterwards with a facing of stucco or "mastic," it has proved by no means a success. Even when built of the best material, it is a question, leaving aside considerations of art and taste, how far this proceeding is desirable; for a wall of bonded masonry has a degree of elasticity or pliability, a faculty of yielding very slightly in the joints, which is not without its value. A slight settlement in the foundations, or a dislocation from changes of temperature or from changes in the material, through setting and the effect of time, or from chance vibration, may in a bonded wall be so distributed among the joints, and taken up near its origin, as to be of small account, while in a homogeneous mass of concrete it is likely to extend, and make a rift, like a crack in a board. This is a danger to which concrete is liable, because it is very apt to shrink during its setting, and that for a good while after it is laid, though the shrinking may be a good deal reduced by increasing the quantity of sand to a maximum. When the adhesion of the lime or cement to the sand is as strong as its cohesion, it is clear that the strength of the mass is not weakened by the addition of sand so long as there is enough of the building substance to completely fill the interstices, and cover each grain of sand with a film to connect it with its neighbor. All that is necessary, therefore, is to provide cement or lime enough to fill the voids between the grains of sand or gravel, with a slight excess to cover imperfections of mixing; and in most mortars or concretes any excess above this is an element of weakness rather than of strength, besides increasing the shrinkage in setting.

The difficulty is, and a very serious one, that to intrust the mixing of the materials to ordinary laborers is to run great risk of uncertainty and inequality in the product. Carelessness in mixing, which would be almost certainly the result, would give too much mortar in one part, and too little in another, making both parts weak, and causing uneven shrinkage. To avoid this difficulty requires that either very careful and skilled workmen shall be employed, and a good deal of time given to mixing, which is expensive; or else that a large excess of cementing matter shall be used, so that even with very imperfect mixing there shall be cohesion everywhere; and this last involves a sacrifice of the quality of the whole mass. This is a reason for preferring to mix and mould the stone or concrete at the factory rather than to build it into a single mass at the work as is done with the béton-coignet. (We speak, of course, of the finer kinds of concrete, those which assume the character of a building-stone.) The fact that the interior of a wall may properly and profitably be built of a coarser material, while the facings are of a finer, tends in the same direction, since it is easier and safer to build facings of blocks, and then fill in with coarse concrete, than to fill in a boxing simultaneously with linings of fine concrete and a case of coarse. As a matter of fact, except in few cases of the rough, stuccoed concrete to which we have referred, and which we believe has had but little success, there has been, so far as we know, no serious attempt in the United States to raise buildings of concrete in the mass.

The durability of concrete can as yet, except in the rough, hardly be considered proved. It is not clear that in the United States any artificial stone has been produced that can withstand outdoor exposure as well as natural stones, especially in the severe climates of the Northern States, in which, in fact, but few even of natural stones have shown themselves sufficiently durable. In Europe, we believe, there has been rather better success; but no structures of any of the modern artificial stones are old enough to give very conclusive testimony. The béton-coignet, which has borne the climate of France well, we are told, is comparatively new. Fifteen years are but a day, or should be, in the life of a building; and the climate of France is not a very trying one. There is apparently no difficulty in preparing a concrete which shall resist dead weight as well as most natural stones. It appears, however, as is indicated in a communication which we publish elsewhere, that some concretes at least are pretty susceptible to concussion and vibration. There is a general presumption of durability in favor of substances that are slowly compacted, over those that are rapidly manufactured, as it is a general law of nature that deliberate growths are the most durable; and it is hardly likely that any artificial process will be found quite able to compete with the slow deposit of the quarry. The best concretes have been found to possess valuable waterproof qualities; and the use of hydraulic cement may make a concrete more impervious to water than most sandstones. Nevertheless the fact remains, that thus far it has not been found in outside work to withstand successfully the climate of the United States.

SOME NOTES ON THE EFFECT OF VIBRATION AND CONCUSSION ON ARTIFICIAL STONE.

BY A MEMBER OF THE R. I. CHAPTER, A. I. A.

THE use of artificial stones has been at various times urged with much warmth and vigor of argument, and it is probable may increase to a large extent, if they shall be found trustworthy and durable. The mass of facts already on record is as yet, however, hardly complete enough to give full confidence in the stability of this material; and it is very desirable that all indications, either adverse or favorable, should be made known to the profession, in order that a full knowledge of the matter may be readily attained. The experiments and facts related below indicate a possible source of danger and failure, which deserves thorough investigation; and if confirmed by trials in other places, and on materials of different make, would certainly condemn the use of any similar stone in positions exposed to vibratory or concussive action.

The stones on which the experiments were made were of the variety known as "Frear Stone," the inventor's formula for which, according to Major-Gen. Gilmore's Report on Artificial Stones, is as follows: "One measure of hydraulic cement [that used was Portland cement] to two and a half measures of sand, moistened with an alkaline solution of gum-shellac of sufficient strength to furnish one ounce of the shellac to one cubic foot of the finished stone." The stone was made by a responsible company, under contract, and warranted to be of the best quality of material and workmanship in every respect. It was, however, compacted, not by hydraulic pressure, but by tamping with a wooden tamp, shod with iron, into a wooden mould; a mode of manufacture pursued by most of the makers of such stone, as the blocks required are usually too large, and of too varied form, to be submitted to a press. The material was not prepared for the purpose of experiment, but was furnished in course, in fulfilling the contract.

Having been induced in 1872, by the usual desire for economy on the part of my client, and by the favorable reports received from other places where the material had been used, to face the

two fronts of a building with ashlar six inches thick, made in large slabs and backed with brick, my attention was called (some weeks after the stone was set, and the building nearly completed; it being plastered, and the floors laid) to the development of cracks in the stone, occurring not only where a settlement or pressure might have produced them, but in positions which could not be explained by any such cause. These cracks continued to increase in number, showing themselves in the middle of stones, on the tops of belt-courses parallel with the sides of the building, horizontally across slabs, &c. The time elapsed between the making and setting of the stone seemed to have no appreciable influence; as one pilaster, which was made and put in place immediately after making (the original slab having been broken by accident), did not show as many as those made months beforehand. There were no indications of settlement in the granite base, or elsewhere about the building. The cracks increased to such an extent, that, in order to avoid the effect of frost from water freezing in them, the owner, by my advice, finally caused the building to be thoroughly oiled and painted, after filling the cracks. The strength of the building was not in any way dependent on the stone.

At the same time, another large contract was being executed by the same company; and it was on the stone furnished for this, that the following experiments were made.

My attention was drawn to the influence of vibration in inducing fracture, by the fact, that an apparently sound stone in the base course of a balustrade, immediately over and resting on the iron lintel of the store-front, developed a crack, which gradually extended through the stone, and seemed to be produced by the tapping of the iron-workers in fitting up the portico, some ten or twelve feet from the bed of the stone. It had been designed to use steps made of the artificial material, and finished on both sides, so as to form an absolutely fireproof stairway. Three of these steps I subjected to the following tests: —

The steps were apparently sound in all respects, five feet ten inches long between bearings, ten inches deep, fourteen inches wide, and were marked as made in June, ten weeks before the tests were applied.

1. The step being in position on bearing-blocks of wood, a weight of 1,215 pounds was applied, on a six-inch bearing in centre of step, without visible effect.

2. A weight of 135 pounds was then laid on centre of step, on six-inch bearing; and the stone was struck on top, about half way between weight and end of stone, at right angles with length, two light blows with the butt end of a 2″ x 14″ plank weighing thirty-two and one-half pounds. At the second blow the stone broke between centre and bearing, and dropped.

3. A similar step was placed in position; and a plank 2″ x 14″ was laid on top, resting fairly on the whole length. A weight of 135 pounds was then allowed to drop on the centre of the plank, from a gradually increasing height, commencing at one inch. When the fall was increased to six inches, the step broke in centre, and split at bearings. The plank was uninjured.

4. A weight of fifty-six pounds was allowed to fall from a height of twenty inches on a step set in place, with others below and above. The step was cracked.

It is worthy of notice, that the building first mentioned was exposed to strong vibration, from passing of heavy teams in the streets. It is also to be noticed, that the stones removed from the last-named building (where, of course, they were rejected), while lying on the ground, gradually became filled with the surface-cracks, forming, in many cases, a complete network over the stone, and extending from day to day, although the stones seemed still to remain solid.

These observations are published with the desire to throw some light on the nature of stones composed principally of Portland cement, and to induce observers in other cities to investigate the subject, and report the result. The experiments seem to indicate, in the material, a sensibility to vibratory or concussive forces, which will forbid its use in floors or as lintels, unless fully strengthened by iron. The test by the mere application of dead weight, it will be seen, leads to a very delusive and possibly fatal confidence. Whether the same liability to fracture under vibration or concussion exists in the stones compounded of Teil lime, or the Coignet-Béton, as now manufactured and sold for arches, floors, &c., is a question which ought to be determined by careful experiment on the materials as supplied for buildings; and it is much to be desired, that some competent, disinterested authority may give us the result of such an inquiry. As a matter of general importance, it might well claim the attention of the proposed Bureau of Architecture.

THE ILLUSTRATIONS.

RHODE ISLAND HEADQUARTERS, CENTENNIAL GROUNDS, PHILADELPHIA. MESSRS. WALKER AND GOULD, ARCHITECTS.

THIS building is 21 feet x 42 feet, with an addition to the rear of 6½ feet x 19 feet, and an open porch in front 6 feet x 14 feet. There are in it ladies' and gentlemen's waiting-rooms, with lavatories conveniently arranged, and a luggage-room in the rear of entrance-vestibule, with small slide-doors opening to both ladies' and gentlemen's rooms. It is built of solid timber, the framework showing on the outside. The roof is covered with Pennsylvania black slate. The interior is very plain, the rooms being sheathed with narrow boards, the joints running horizontally. The same material shows both outside and inside. No plaster has been used.

There are no sleeping-apartments provided; the building being intended merely as a rendezvous for Rhode Island people, while visiting the exhibition.

UNITED STATES COURT-HOUSE AND POST-OFFICE, ATLANTA, GA. MR. WILLIAM A. POTTER, SUPERVISING ARCHITECT, TREASURY DEPARTMENT.

This building, for which the United States Government has appropriated the sum of one hundred and sixty thousand dollars, is one of the buildings designed by Mr. Potter since he has been Supervising Architect of the Treasury Department.

ROGERS HIGH SCHOOL, NEWPORT, R.I. MESSRS. GEORGE C. MASON AND SON, ARCHITECTS.

This structure is built of Danvers face-brick, red and black, with Ohio stone trimmings, and a belt of encaustic tiles on the front. It is 53′ x 60′. In the tower there is an observatory. The structure was completed in 1874, for a sum not exceeding thirty thousand dollars.

BLOCK OF FIVE HOUSES, LONGWOOD, MASS. MR. GEORGE T. TILDEN, ARCHITECT.

This is one of several blocks of houses erected by A. A. Lawrence, Esq., on and about Monmouth Park, Brookline. The exterior walls are of Somerville face brick laid up in black cement-mortar, with occasional decorative courses in black brick. The circular discs on the sides of end houses are filled with tiles. Kitchen and laundry accommodations, besides furnace and fuel rooms, occupy the basement stories.

ERRATUM. — In the description of the Chicago Club House in the issue of May 6, it was stated that the building was located upon Broad Street. It should have read, upon Monroe Street.

LANDSCAPE TREATMENT OF RURAL AND SUBURBAN PROPERTY. — II.

READ AT THE NINTH ANNUAL CONVENTION, A. I. A., BY A. J. BLOOR, FELLOW.

IN the plan of a neighborhood laid out in landscape style, a number of quite small plats will naturally be formed by the sharp corners formed at various points, generally by the intersection of avenues on diagonal lines with other roads. These *quasi* triangular spaces, though they may look as mere spots on the show-map, and though they would be nearly worthless as adjuncts to the plats nearest them, or for any other purpose of simple utility, afford as public property, under the control of the proper authorities, opportunity for very agreeable displays of vegetation and color, and enhance to a very considerable extent the attractions of pleasure travel on the property.

The main avenues, of whatever width, in a high-class neighborhood tract should be planted at the side, with shade-trees disposed in one, two, three, or even four rows, according to the various circumstances to be considered. The designer, if of good taste, judgment, and experience, will know where omissions in the row-planting should occur, to allow for peculiarities of grouping in adjacent trees, or to admit of an unobstructed view of pleasing local objects or distant prospects from a particular standpoint.

Groups of trees should be scattered over the various subdivisions of the neighborhood tract. They should be chiefly specimens of first-class growth (speaking more particularly in relation to size), and studied with reference to the landscape effect of the whole estate (I do not know how to communicate by what rules, —

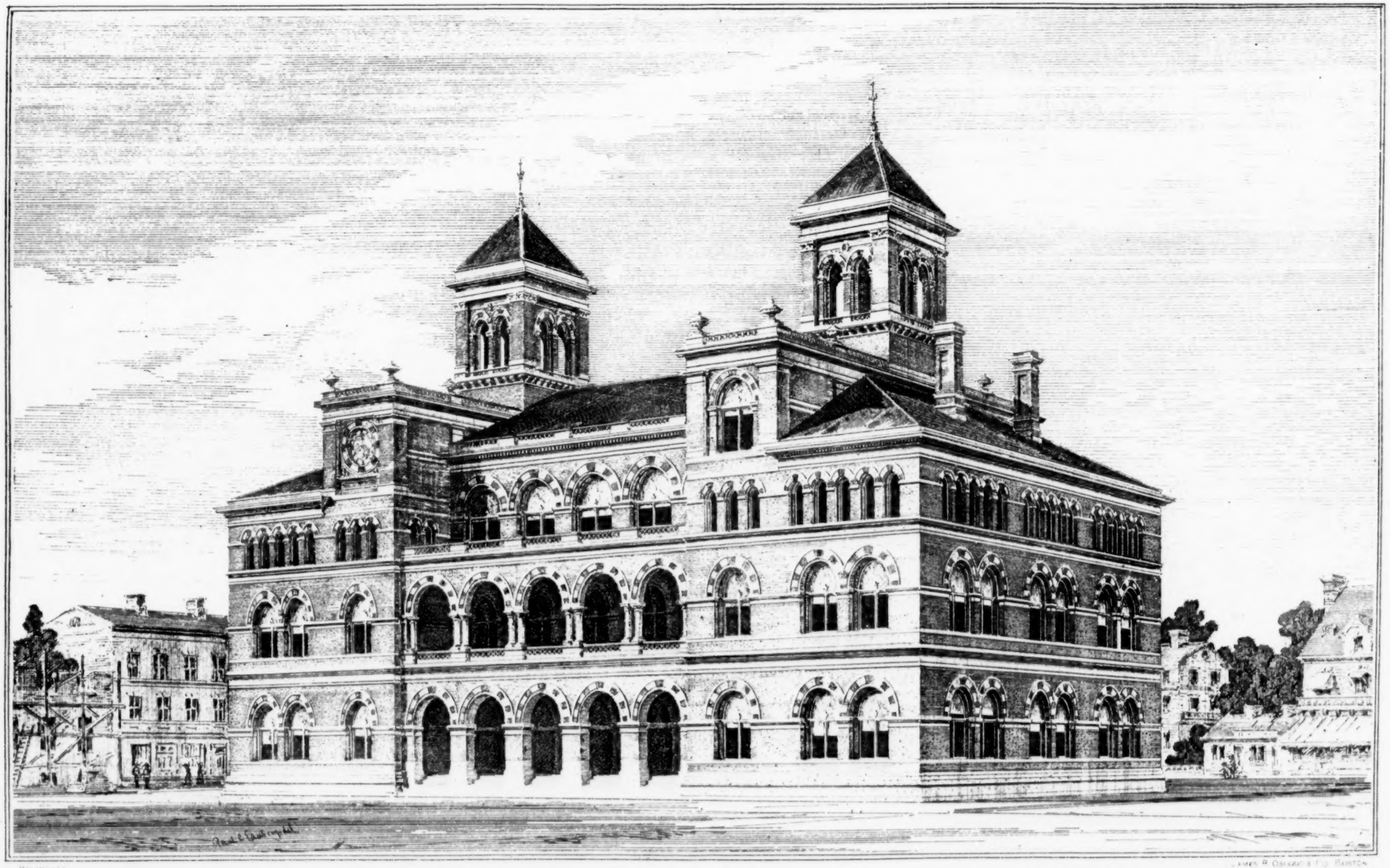
WM. R. WALKER
THOS. J. GOULD } ARCHTS.

RHODE ISLAND HEADQUARTERS, CENTENNIAL GROUNDS, PHILADELPHIA.

PROVIDENCE, R. I.

HELIOTYPE.

JAMES R. OSGOOD & CO. BOSTON.



U.S. COURT HOUSE AND POST OFFICE. ATLANTA. GA.

Wm. A. POTTER, SUPERVISING ARCHITECT TREASURY DEPT.

First Story Plans

BLOCK OF FIVE HOUSES

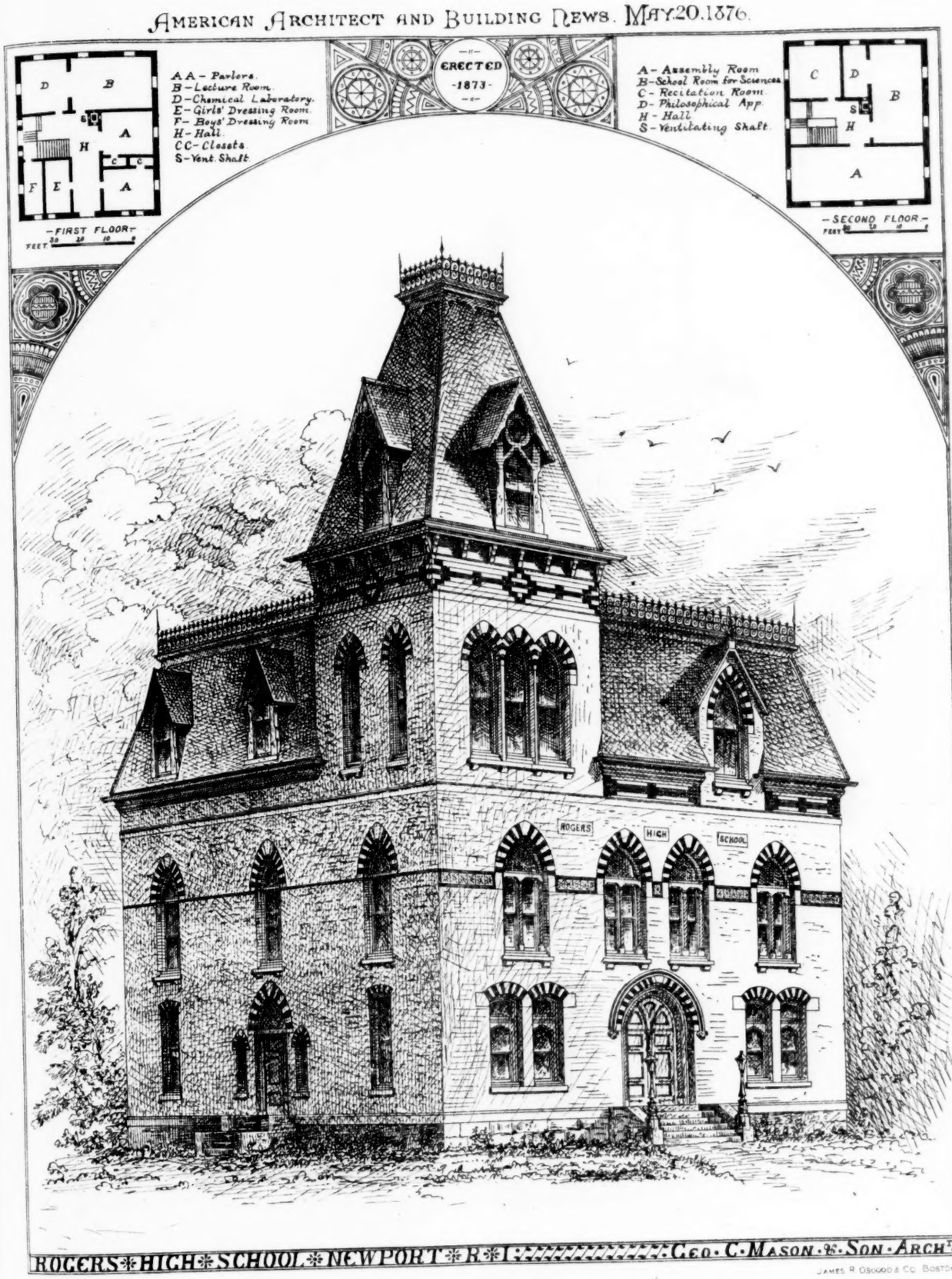
LONGWOOD MASS

G·T·TILDEN·ARCHITECT·18 PEMBERTON SQUARE·BOSTON·MASS·

American Architect and Building News. May 20. 1876.

HELIOTYPE

JAMES R. OSGOOD & CO. BOSTON



ROGERS * HIGH * SCHOOL * NEWPORT * R. I. GEO. C. MASON & SON, ARCHTS.

JAMES R. OSGOOD & CO. BOSTON.

HELIOTYPE

"*poeta nascitur, non fit*"), either with or without the additional planting that will probably be done by owners of the various plats. That is, the authorities of the tract should provide, and should retain the control of, these specimens; so that, even if any of the owners of the various plats do not care to plant any thing more than ornamental trees (which are generally of comparatively low growth) and shrubbery, these masses of high-growth forest vegetation at least will be secured for the landscape. As permanent picturesque effect, not shade, is the main object of such planting, there should be a large admixture of evergreen timber along with the deciduous. The experience of the immediate neighborhood should be ascertained as to the suitability or unsuitability of the soil or other conditions to the various kinds of forest-trees.

Although it sometimes happens that a sufficient natural drainage for general purposes is assured to a large property by the sloping contour of the main surfaces, and by the texture of the soil, it is well to consider the possibility of purchasers desiring to thoroughdrain their respective allotments, with reference to the harmonizing of such drainage by individuals with a general plan for the whole estate. By economical management, the expense of thorough drainage may be made much less than is generally considered necessary. Where large tracts are concerned, it may often be kept down to nearly as low a figure as an average of seventy-five dollars to the acre, and partial drainage in proportion.

The advantages of thorough drainage are now universally conceded. The British Government makes a large revenue by lending every year many millions of pounds sterling to farm tenants and small proprietors, who in their turn find their profit in using the funds they borrow to drain and reclaim fens and lowlands on the farms they occupy, which, undrained, have for centuries yielded nothing to agriculture. That thorough drainage not only almost neutralizes the bad effects of drought, deepens the available soil by warming the lower strata, and opening pores for them to receive the fertilizing gases of the atmosphere; retards evaporation, and the consequent cooling of the soil; prevents it from becoming sour and harsh; makes it available earlier in the spring and later in the fall, — that it does not only this, but much more for agriculture, is well established. It carries off below the soil the stagnant water or humidity, which on the surface breeds malignant exhalations, and thus prevents that state of the air which produces ague and chills and fever, — the curse of so many of the loveliest country and suburban districts throughout the land. Another advantage is the opportunity it affords for replenishing and keeping pure whatever ornamental water is embraced in the scheme of an improved property.

As an enterprise of the kind contemplated in a neighborhood tract can be carried out to a maximum success, either pecuniary or artistic, only by harmonizing individual interests with the general benefit of all who are likely to be partakers in it, certain points should be reserved free of the individual control of purchasers or tenants. The design should be carried out in its totality as fast and as completely as circumstances permit, and should be carefully preserved from all preventable risks of failure or deterioration through the possible introduction of unfit elements. Into whatever hands the discretionary power for the government and policing of the property may be put, — whether retained intact in the hands of the projector, or shared by him with partners, or merged into all or some of the prospective owners of the allotments, — there should be reserved unobstructed facilities for the proper treatment of the following points: viz., drainage, purity of water, planting, quality, use, and location of all the structures on the tract, and assessments for keeping it up to its maximum condition. It may be said that these restrictions unreasonably curtail the liberty of the individual. To which the answer is, that for every real infringement of such liberty it offers in return many otherwise unattainable advantages, at the same time that it presents needful obstacles to any license on his part in afflicting his neighbors with nuisances or unsightliness where his own allotment is concerned, and opens up to him as many instances of what is agreeable and sightly as there are of prominent objects in his outlook over his neighbors' grounds, and in his daily passage to and fro over the tract. When the superior character of a neighborhood tract is once established, and — by means of judicious methods of advertising — generally known, one of the greatest attractions about it to seekers of a suburban residence will be that these restrictions exist for the common benefit.

THE new Catholic Cathedral at Savannah was dedicated recently.

ENGLISH INSANE-ASYLUMS COMPARED WITH AMERICAN.

A REPORT now some weeks old, by Dr. Wilbur of Syracuse, N.Y., in which he compares the cost of English and American insane-asylums, has furnished a paragraph to all the newspapers. The Architect published it in the number for April 29; and, although the subject is doubtless well enough understood by its professional readers, it may not be amiss to mention a few facts in explanation of some of Dr. Wilbur's statements.

It is not to be denied, that there has been, in several notable examples of recently built asylums in this country, an altogether unnecessary expenditure. I wish, however, that what I have to say should be understood as applying especially to the two new lunatic hospitals now nearly completed in the State of Massachusetts, — the one at Worcester, costing two thousand dollars per patient; and the one at Danvers, costing twenty-five hundred dollars per patient.

Dr. Wilbur's statement is, that the English asylums cost only seven hundred and fifty dollars per patient; and the inference is made, that ours are by comparison "extravagant palaces," rather than appropriate homes for "charity patients." Is this so? Have we had set before us in these comparisons all the factors in the case?

In the first place, all durable dwellings cost more in Massachusetts than in England. Our churches cost more; our schoolhouses cost more; our dwellings cost more; and so, of course, our asylums and hospitals cost more. This would be the case were the buildings compared precisely similar, and for the simple reason that labor and most kinds of material are there so much cheaper.

Secondly, The buildings are not similar, and cannot be, by reason of differences in climate, management, habits of the occupants, &c. In respect to buildings for the insane, these inevitable differences are very considerable, some of which are the following: —

1. It is the practice in England very generally, in such buildings, to dispense with cellars and basements, simply excavating shallow trenches for the foundations, and keeping the ground floor very low. Here, of course, where frost often penetrates four to five feet in depth, we have to keep safely below it. Again, more extensive basement accommodation is needed for the heating apparatus, storage, fuel, &c. The underpinning walls are therefore made higher, thoroughly to light the substructure, and to keep the ground floor well above dampness and deep snows.

2. Our climate demands that there shall be paid to the heating of our buildings a degree of attention quite unnecessary in England. Except in unusual circumstances, nothing is required there but open fireplaces; and the people are entirely comfortable with an indoor temperature of sixty to sixty-five degrees. Here there is great complaint if there is not maintained an indoor temperature of seventy to seventy-five degrees, while the outside temperature, enforced by a fierce north-wester, may fall to twenty degrees below zero. In these circumstances, where large buildings have to be heated, an elaborate and expensive steam-heating apparatus, with its enormous boilers, miles of pipes, and cords of radiators, has been found the most serviceable, and, in fact, the only really adequate appliance. All this, again, involves the necessity for an abundant and constant supply of pure air to all parts of the building. Now, pure air must be supplied from a perfectly and uninterruptedly pure source, perhaps at a distance, not taking the risk of getting whatever happens to be nearest; and this, if thoroughly done, is never otherwise than expensive.

3. With such provision for a large volume of incoming air, there must needs be an equal provision for removing the impure air. Here, again, is another large expense, which is for the most part avoided abroad, the open fireplaces answering in part, and the milder climate making it possible to live more with open windows.

4. Moreover, in addition to the cost of the heating and ventilating apparatus *per se*, in our asylums there has to be added a large sum for the greatly increased thickness of walls in which are placed the numerous flues bringing in the pure air, and carrying away that which has been vitiated.

5. Having the steam-boilers, pipes, and radiators for heating, and the engines for supplying motive power for forced ventilation, our asylums need a repair-shop, and usually also a carpenter's and cabinet shop, each supplied with the most useful tools and machinery. Then the laundry is provided with steam-driven apparatus, and the same is sometimes true of the bakery. Of course the aggregate expense of all these items is quite large, but is justified in this country — as it might not be abroad, although somewhat

in use — by the consideration of greater economy of working expenses after the "plant" is once provided.

6. In regard to interior accommodation and arrangement, our asylums rely less than the English do upon large associated dormitories. With us, five or six patients are considered enough to occupy any dormitory, however large; and as few as possible of these are used, the desideratum being to give to each patient a single room; and these single rooms are almost universally larger than the single rooms in English asylums.

Now, when we sum up these various items of difference, differences legitimate and necessary, it will be seen why our asylums cost so much more than the English. Take away from the American buildings only those things mentioned above, rendered necessary by our climate alone, and you strike away at one blow not less probably than thirty per cent of their entire cost. Another fifteen per cent is to be reckoned as the real difference in cost of building the same thing in the two countries. When you have added another fifteen per cent to express the difference between prices at a gold standard and at an inflation standard, we get a total of about sixty per cent, which will be found not far from the exact truth. Apply now this rule to the Worcester Hospital, where the cost per patient is two thousand dollars, from which, if sixty per cent be taken, just eight hundred dollars is left, — a sum nearly the same as that given by Dr. Wilbur to be the average cost of the English asylums.

In conclusion, I believe there is no risk in saying that whenever any one of the doctrinaires or critics who complain of the extravagance of Massachusetts lunatic hospitals is called upon to assume the responsibility of building one under the controlling conditions of the locality and the time, he will find himself speedily letting go his hold on theories and dreams, and will inevitably end pretty much like others who have attempted to solve the same problem.

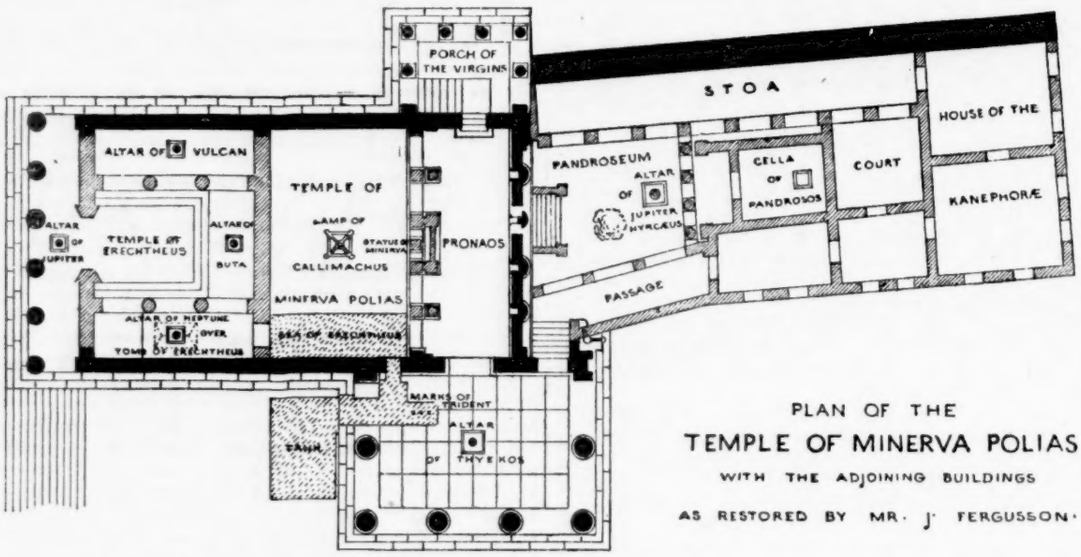
G. D. R.

MR. FERGUSSON'S RESTORATION OF THE ERECHTHEUM.[1]

BY A. S. MURRAY.

On the Acropolis of Athens, to the north of the Parthenon, and nearly parallel with it, stand the ruins of a Greek temple, called generally the Erechtheum, but sometimes also, and perhaps more correctly, the Temple of Athenè Polias. It was a double temple, and both names seem to be applicable. The spot where it stands was also in a peculiar sense doubly sacred, since it contained the two celebrated witnesses of the contest between the deities Poseidon and Athenè, — a well of brackish water which he had made to spring from the rock with a stroke of his trident, and an olive-tree which she had caused to grow from the same barren soil. Both the olive and the well were religiously preserved. The cause of Poseidon was identified with the legendary hero Erechtheus; and so it happened, that under the double name of Erechtheum, and Temple of Athenè Polias, was perpetuated the memory of this divine contest. The temple was, however, double not in theory only, but also in fact; inasmuch as the eastern division stood on a high base, as usual with Greek temples, while the floor of the western part was about ten feet lower, and nearly on a level with the ground. There must have been some powerful motive for keeping this western floor so close to the ground; and such is not far to seek, if we only remember that the brackish well was within the building, as is expressly stated by Pausanias. To have built the usual high basement over or round this water, with the sacred marks of Poseidon's trident visible on the rocks, would have been highly irreverent. An olive-tree growing up through such a basement would have been absurd to look at.

Herein lies the first serious difficulty which the restorer must encounter. From a practical point of view, the olive could not have grown comfortably inside the temple, even with part of the roof removed to give it light. Yet up to now it has regularly been placed there, so strong has been the conviction that the two memorials of the great contest must have been in close proximity. Beyond this conviction, however, there was no argument in favor of this proximity, which could compare with the extraordinary architectural difficulty of admitting the tree to the interior; and accordingly all previous restorations have been more or less generally characterized as practical failures. Mr. Fergusson has placed the olive in what is now apparently open ground to the west of the ruins; and the merit of his scheme consists not only in avoiding the practical difficulties which had beset his predecessors, but much more, as we think, in enabling him to explain satisfactorily what was perhaps the greatest enigma presented by the ruins; viz., the way in which the northern portico overlaps the main building, as it now stands. But it may be asked, How could this temple be regarded as a shrine of Athenè, if the precious symbol of her victory was not within it? if, on the contrary, the most striking feature of the interior was the presence of Poseidon's well, the "sea of Erectheus," as it was called? To this it may be answered that, in Mr. Fergusson's scheme, the tree is still practically within the temple. It is placed in an open court, by means of which he connects the western end of the temple, as it stands with the doubtless smaller temple of Pandrosos, which, according to Pausanias, was attached to the main building, and that necessarily in a westerly direction. It must have been to mark and to serve this attachment, that the northern portico was made to overlap as already pointed out.



PLAN OF THE
TEMPLE OF MINERVA POLIAS
WITH THE ADJOINING BUILDINGS
AS RESTORED BY MR. J. FERGUSSON.

To return for a moment to the word "double," as applied by Pausanias to the temple. We have seen how this term might be justified by the two divisions still observable in the ruins. Externally, however, there would be no adequate justification of "double" in the architecture. On the other hand, no phrase could better describe this attachment of the Pandroseum, which Mr. Fergusson proposes at the west end of the ruins; the more so since the unity of the whole structure would be secured by the existence of the olive in one part, and the well of Poseidon in the other. It should here be stated, that though Pausanias expressly describes the Pandroseum as attached or even only adjacent, as his word συνεχής indicates, it has hitherto been the practice to find a place

[1] On the Erechtheum. By James Fergusson, D.C.L., F.R.S. A paper read before the Royal Institute of British Architects, on Feb. 14, 1876.

for it within the main building as it now stands ; so that, in fact, the temple has been made out to be triple instead of double.

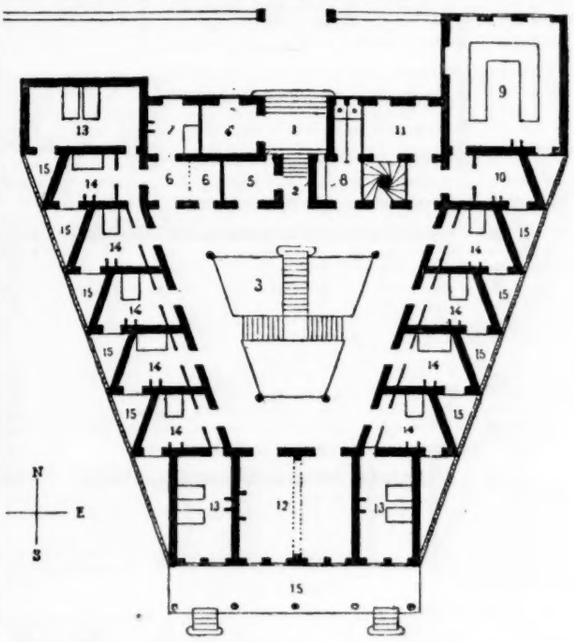
In obedience to tradition, it was necessary that the Pandroseum should be on a lower level than the adjacent building; since the story goes, that a dog once entered the temple of Athenè, and ran down from it into the Pandroseum. This again is answered in Mr. Fergusson's plan by the fact that the level of this western part is about four feet lower than that of the adjacent structure. There is, however, in the restored plan of this western building, a phenomenon which, notwithstanding the array of facts in its favor, still remains singular ; viz., that, instead of continuing the lines of the main temple, it goes off at an angle without, to all appearance, any diverting cause. It is a fact, no doubt, not to be gainsaid, that the door in the western wall of the main temple centres not with that building, but with the new lines laid down by Mr. Fergusson. With them also runs parallel a still existing wall, which stretches westward from the southern portico about eighty feet, presenting a rough surface, which could not have been its original state. To meet this, he proposes to place here the stoa or portico, of which mention is made in the Greek inscription concerning the building of this temple now in the British Museum. For this stoa it had been impossible to find a satisfactory position in previous attempts at restoration.

All these details, though of immense importance when it has once been agreed upon to place the olive in an open court, in what is here called the Pandroseum, and not, as hitherto, within the main building, must for the present wait till something like a general sanction has been obtained for that step. Meantime it must be gratifying to Mr. Fergusson to find, that, in this most essential particular, the same conclusion had been arrived at simultaneously by Prof. Michaelis of Strasburg, well known in particular for his splendid work on the Parthenon, and in general for his researches on the Acropolis of Athens. Through the kindness of Prof. Michaelis, a copy of a map of the Acropolis which he had just prepared, but which in its published form he had not then seen, was sent to me a day or two before Mr. Fergusson's lecture ; and I think it at least an interesting coincidence as regards the time and the general direction of the discoveries in both cases. Besides, the fact that while with Mr. Fergusson architectural arguments may be presumed to have weighed most, Prof. Michaelis, on the other hand, would naturally feel strongly the influence of literary tradition, ought to lend special recommendation to the two plans. It was evident from the plan of Prof. Michaelis, that, except in placing the olive and the altar of Zeus Herkeios in the open to the west, he does not further agree with Mr. Fergusson, but prefers to treat the temple of Pandrosos as a small building attached to one corner of the western wall. It must be said that this neither looks promising in itself, nor does it betray the special and minute examination of the ground to the westward, which we find in Mr. Fergusson's paper.

BATHING-ESTABLISHMENT AT HELIGOLAND.

FOR the benefit of those of our readers who do not already know it, we will say that Heligoland is a little rocky island in the German Ocean, about twenty-five miles from the mouths of the Elbe, the Eider, and the Weser. It is barely three miles in circumference; but as it has two very good harbors, and moreover has wells giving an abundant supply of fresh water, the English thought it worth taking from the Danes. The manner of its acquisition is peculiar enough to be deserving of mention. In 1807, Napoleon Bonaparte having converted the Emperor of Russia into a friend by the Peace of Tilsit, the English became fearful that Russia would employ the Danish fleet against them. They therefore determined to seize this fleet. An English fleet and army was immediately despatched, and effected the seizure on the 7th of September, 1807: as a branch of these operations, a small squadron was sent to Heligoland, which surrendered without a blow; and during the rest of the war it served as a refuge to the English cruisers, who erected batteries and light-houses there. Under English rule the population has grown and prospered till it now members about four thousand souls, who at present reap the benefit of the water-cure establishments, and the attendant gaming-houses that have been established there of late years.

It is to one of these bathing-establishments that we wish to draw the attention of our readers. The proprietor demanded of his architect, that he should build him a house containing about twenty-five or thirty chambers, together with a dining-room, one or more saloons, a kitchen, and the necessary dependences. Every thing was to be comfortable but simple, all costly decorations being forbidden because of the difficulty and cost of conveyance. The building was to be only two stories high; and because the island is exposed to cold winds of great violence, blowing from the north, while the wind from the east, even though it be less glacial, has the demerit of blowing all the time, the proprietor imposed upon the architect the rigorous condition that all the chambers must face the south, and must obtain light and air only from that side. With such a programme, the first idea that would suggest itself would be to erect what the French call *un bâtiment simple*, that is, one in which the rooms are strung out in one straight line upon the same side of a corridor; but the care and service of such a building would have been extremely difficult, and would have demanded a large corps of servants. Moreover, the façade would have been something over two hundred and fifty feet in length, whereas the lot measured only about half as much. Under these circumstances the architect, an Englishman, devised the arrangement which is shown in the cut, which we borrow from the Travelling-Notes of an Architect in the North-west of Europe, by M. Félix Narjoux. This cut needs but little explanation. The rear of the building, which is exposed to the north winds, contains only the dining-room and its accessories, for which



1. Porch.
2. Vestibule.
3. Hall.
4. Bar-room.
5. Porter.
6. Office.
7. Proprietor.
8. Lavatory.
9. Dining-room.
10. Sitting-room.
11. Pantry.
12. Parlor.
13. Double-bedded room.
14. Single-bedded room.
15. Balcony.

a northern exposure was admissible; moreover, it is protected by a projecting cliff. The interior of the building is given up to a large glazed hall, or vestibule, from the centre of which the principal staircase takes its rise. The bed-chambers occupy the two inclined sides of the building; the inclination of the walls giving the opportunity of making the windows in the re-entrant angles open to the south as required. Before each window is a little triangular covered balcony, unconnected with its neighbors on either hand, and entirely protected from winds blowing from three points of the compass. In the basement are the kitchen and dependencies; while the first story is arranged substantially like the ground floor, except that the dining-room and saloons are replaced by bed-chambers; while bath-rooms, linen-closets, &c., are substituted for the smaller divisions of the lower floor. The covered gallery which, on the ground-floor, adjoins the large saloon, and opens upon the garden by which the beach is approached, becomes on the first floor a balcony for the chambers on the front, and in summer is covered by awnings. The architect seems to have devoted himself exclusively to the planning of the building; for the exterior, which is of brick with stone trimmings, is much more simple than such buildings usually are. The simplicity of the arrangement adopted makes the intercommunication and attendance very convenient and easy.

CHICAGO. — Ten million dollars' worth of new buildings were erected in Chicago last year, making a frontage of over ten miles.

NOTES AND CLIPPINGS.

ACADEMY OF NATURAL SCIENCES. — In 1868 the Board of Trustees of the building fund of the Academy of Natural Sciences of Philadelphia purchased a lot of land upon Race and Nineteenth Streets; and in 1872 began to build in accordance with the plans drawn by Mr. J. H. Windrim. In the fall of 1875 the building was so far completed that the society began to move its collections to the new building. On the first day of the present month, one wing of the building, — all that is to be built for the present, — which measures 186 feet on Race Street, by 75 feet on Nineteenth, was opened to the public. The style in which the building is built is the collegiate Gothic. The walls are of brick, faced with green serpentine stone. The floors are constructed of iron joists, carrying brick arches between them; while the floors of the vestibules and landings are laid with encaustic tiles. The roof is of iron, and all possible care has been taken to render the building fire-proof.

The first floor and entresol are divided up into rooms for the curators and artists, for the botanical and entomological collections, and for the library. This latter is a room 130 feet long, and 30 feet between the fronts of the bookcases; as it is 18 feet high, there is room for a gallery with additional bookcases running all round the room; it will contain about 30,000 volumes. The second or museum floor is 180 feet long and 60 feet wide, with two galleries; the first, 10 feet above the main floor, is 21 feet wide; the second, 9 feet above it, is 18 feet wide. This floor is well lighted by windows on the sides and ends, and also by a skylight 80 feet long. The galleries and roof are supported by a colonnade of wrought-iron columns. This building was built by subscription; $240,000 being subscribed for it by some five hundred citizens.

CATHOLIC CHURCH. — The Catholic Church of St. Charles Borromeo, built by Mr. Durang, and recently dedicated at Philadephia, is a building in the classic style, measuring 150 feet by 75, exclusive of the two western towers. The façade, which sets somewhat back from the towers, has, it is said, an "archway of strong members covering a triple arrangement of arcades finished in the Ionic order, with monolithic columns." The walls are of Trenton stone trimmed with Newton sandstone. The Corinthian order is employed in the interior. The sanctuary is divided into three parts by grouped and coupled columns, the outer divisions forming side-chapels which contain the altars dedicated to the Virgin and to St. Joseph. The high altar, which is thirty-eight feet high, is of Italian marble inlaid with colored marbles. The windows are filled with stained glass, which illustrates the passions. The seats in the galleries are arranged at such an inclination that a full view of all the ceremonial of the mass can be obtained by each spectator.

THE NEW COURT-HOUSE. — The new Court-House building has cost New York City, so far, between $14,000,000 and $15,000,000, and is still in an uncompleted state, although the commissioners expect to commence work on it in a few days. No estimate has been made as to the probable cost when finished.

PROPOSED MUNICIPAL REFORM BUILDING. — The Society of Municipal Reform, New York, has purchased a plot, 25 x 100, on Madison Avenue, near Twenty-seventh Street, for $21,500, as a site for a permanent society building. A brick building will be erected at a cost of some $20,000. The Madison-avenue front will form a suite of offices; and back of these will be a hall which will seat from 300 to 400 persons.

COST OF THE THIRD DISTRICT COURT-HOUSE. — The whole amount paid up to May 1, for the construction of the Third District Court-House, New York, is $197,571.67; and the building is about half finished.

BLIND ASYLUM. — The Wisconsin Board of State Charities has adopted plans for a Blind Asylum, as drawn by Mr. A. Anderson of Janesville.

SYNAGOGUE. — The congregation of the First Jewish Synagogue, Philadelphia, built 1747, between Race and Cluny Streets, were direct descendants of some of the Jews driven out of Spain by Ferdinand and Isabella.

PLASTER MODELS. — An exhibition of all the models for the stone-cutting for the new Public Buildings has just been opened at Philadelphia. These models have been made by Mr. Alexander Calder of Philadelphia, from the drawings of the architect, Mr. McArthur. It forms a large and a very striking collection. Amongst others is the full-sized model of the statue of William Penn, which is to crown the dome of the central tower. The Public Buildings are said to be the largest mass of buildings in the United States; and the tower, which is to be 510 feet in height, is intended to reach a higher altitude than has been attained by any other completed building in the world. This throws out of account the uncompleted spires of Cologne Cathedral, which are intended to be 532 feet in height. It is to cover an area exceeding the area of the Capitol at Washington by 2,809 square feet, and the area of the new Capitol at Albany by 44,301 square feet.

PILE-DRIVING. — When the sand, clay, or other material beneath water, is so closely packed as to prevent the entrance of a pile, a small pipe may be let down beside the pile, and a stream of water forced through it. If this stream be of sufficient power, — and it can easily be made of sufficient power by increasing the height of the tube, and consequently the pressure of the water, — it will loosen the silt, and facilitate the entrance of the pile.

THE FRENCH EXPOSITION. — It is said that only twenty days have been allowed the French architects for the preparation of plans for the proposed exposition buildings for 1878.

ARTESIAN WELLS. — These wells, which derive their name from the French province of Artois, where they were first used, and where there is still an artesian well which has given an uninterrupted supply of water ever since the year 1126, are becoming more and more common in this country; and, since the establishment of the great trans-continental railroads, several have been bored on the line of the Union Pacific Railroad. It is believed that these wells may be used to reclaim portions of the American Desert with as much success as has been attained in the Desert of Sahara, where more than seventy-five shafts have been sunk for the purpose of providing water for caravans, and wherever these wells have been bored vegetation has sprung up, and oases formed. The deepest bore ever made is at Sperenberg, about twenty miles from Berlin; it is still unfinished, although a depth of 4,194 feet has been reached. The deepest bore in this country is the unfinished bore on the grounds of the Insane Asylum at St. Louis, Mo., which is 3,843 feet deep. The well at Grenelle, near Paris, which is one of the most successful, is 1,802 feet deep, and discharges 500,000 gallons in twenty-four hours. The water has a uniform temperature of eighty-two degrees Fahrenheit, and has been used to warm some large hospitals in the vicinity.

MOSAIC. — The French Minister of Fine Arts recently demanded an appropriation of twenty-five thousand francs for the establishment of an *atelier* in connection with the porcelain manufactory at Sèvres, for teaching the processes of mosaic-making. This, like all other schools established and supported by the French Government, will be open to all, free of expense.

COLOGNE CATHEDRAL. — The completion of the Cologne Cathedral is now being proceeded with, more than 700 men having been engaged, and more than 1,000,000 marks spent upon it in 1875. The eight towers which surrounded the octagon are nearly finished up to 200 feet in height, from whence the spires of 110 feet will be superadded. The total height, including the cross, of those towers, will be 532 feet, against 452 feet of the Strasburg minster; 431 of St. Stephen's, Vienna; and 393 feet of the dome at Antwerp.

STEEPLE-JACK. — Recently one of the dormer windows fell from the spire of the church of St. Paul's, Dundee, Scotland, and had to be restored. In order to effect this, a fall and tackle had to be made fast to the top of the spire, which is one hundred and fifty feet above the level of the ground. Because of the high wind blowing at the time, it was impossible to take the first step towards attaching the tackle in the ordinary manner. It is usual to fly a kite over the spire, and, when the kite-string has passed over the proper spot, it is brought to a bearing upon it by means of a second cord. By hauling upon this second cord, cords of greater strength are drawn up, one after another, till at length the tackle itself is drawn up and secured. In this case, the steeple-jack employed, finding it impossible to use his tried ally, the kite, was obliged to resort to the more dangerous method of reaching the top of the spire by means of ladders fastened together, and placed against the sloping side of the spire. It took two days' work to attach the hoisting tackle to the top of the spire.

THE WATTS MEMORIAL. — Watts Memorial Hall, erected to the memory of Dr. Isaac Watts, in Southampton, Eng., was dedicated some time ago. It comprises a block of school buildings covering the site of Dr. Watts's garden, and standing near the chapel in which his first hymn was sung. The building cost about thirty thousand dollars.

DEFLECTION OF BEAMS. — An architect in Bristol, Eng., has invented a new method for measuring deflections or strains on different materials, and thus determining their relative strength. In a letter to a friend in this country he says, "The basis of my instrument consists in using a very small pair of magnetic wheels, each wheel only one-tenth of an inch in diameter; these are connected with a barley-straw as an index; and they are so arranged that they will magnify a deflection 6,480,000 times. Such a result could never be attained by cog-gear, as it would require 3,600 teeth to be accurately cut in a wheel only one-tenth of an inch in diameter, which is impracticable. The instrument has to be built upon solid stone masonry, as the extreme delicacy of these magnetic wheels renders them liable to be affected by every jar in an ordinary building."

OLYMPIA. — Among the many interesting discoveries that are daily made at Olympia, is one which seems to show that the temple was not all built at the same epoch, and by the same hands. The lions' heads attached to the cymatium are not all of the same date: they are of three distinct styles, — the severely antique, the purely naturalistic, and a style transitional between the two. Lions' heads of terra-cotta, richly colored, have also been found in a perfect state of preservation.

AN EGYPTIAN DISCOVERY. —Some Arabs digging among the ruins of the great Temple of Karnac, in January last, came upon a sandstone cist buried in the *débris*, inside of which was the figure of a female hippopotamus sculptured in green basalt. The monument, including the slab, is three feet high, and is admirably carved and polished. A long inscription in hieroglyphics runs along the back, and another is cut on the slab in front of the figure. The inscriptions contain the names of Psammetichus I. and his queen and daughter, and also of a hitherto unknown king.

PLASTER. — It is said that three-fourths of all the plaster sold and used north and west of the Ohio River comes from the gypsum beds at Grand Rapids, Mich. It is claimed to be the purest and best which has yet been worked in the United States.